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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/750,141	12/31/2003	Mineo Yamakawa	070702006900	7926

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EXAMINER	
MCCRACKEN, DANIEL	

ART UNIT	PAPER NUMBER
1754	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/750,141	YAMAKAWA ET AL.	
	Examiner	Art Unit	
	Daniel C. McCracken	1754	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *2/15/2007*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-6, 8-9, 14-41* is/are pending in the application.

4a) Of the above claim(s) *22-38* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☐ Claim(s) *1-6,8,9,11,14-21 and 39-41* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☒ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Citation to the Specification will be in the following format (S. #, ¶) where # denotes the page number and ¶ denotes the paragraph number. Citation to patent literature will be in the form (Inventor #, LL) where # is the column number and LL is the line number. Citation to the pre-grant publication literature will be in the following format (Inventor #, ¶) where # denotes the page number and ¶ denotes the paragraph number.

Formal Matters

As a point of clarification on the procedural posture of this Office Action, Applicants filed a Request for Continued Examination (RCE) on February 15, 2007. The RCE was accompanied by the filing of a large IDS, but with no amendments to the Claims. The Examiner contacted Applicants' counsel, who subsequently submitted a supplemental amendment on May 4, 2007. Further, Applicants' counsel requested an interview, and one was conducted on May 8, 2007. The Interview Summary is attached to this Office Action. The Claims, as amended on May 4, 2007, are treated in this Office Action. Currently pending are Claims 1-6, 8-9, 11, 14-21, and 39-41. Claims 22-38 stand withdrawn from consideration.

Specification

The disclosure is objected to because it contains an embedded hyperlink and/or other form of browser-executable code. Applicant is required to delete the embedded hyperlink and/or other form of browser-executable code. See MPEP § 608.01. *See e.g.* (S. 20-21). Applicants are requested to make a careful and thorough review of the Specification to remove all hyperlinks.

Discussion of Specification

The Examiner makes the following findings of fact with respect to the Specification:

Generally speaking, much of the Specification is cumulative in nature, surveying prior art. It is noted that "a statement by an applicant during prosecution identifying certain matter not

the work of the inventor as "prior art" is an admission that the matter is prior art." *Riverwood Int'l Corp. v. R.A. Jones & Co.*, 324 F.3d 1346, 1354, 66 USPQ2d 1331, 1337 (Fed. Cir. 2003) (citations omitted). As such, the Examiner identifies the following admissions:

1. Methods for controlling nanotube length are old and known. (S. 4, [0018]) ("A variety of methods for controlling nanotube length *are known* (*e.g.*, U.S. Patent No. 6,283,812) and any such *known* method can be used.) (emphasis added).

2. Carbon nanotube synthesis techniques are old and known. (S. 5, [0020]) ("A variety of methods for production of carbon nanotubes *are known*, including carbon-arc discharge, chemical vapor deposition via catalytic pyrolysis of hydrocarbons, plasma assisted chemical vapor deposition, laser ablation of a catalytic metal-containing graphite target and condensed-phase electrolysis. (See, e.g., U.S. Patent Nos. 6,258,401, 6,283,812 and 6,297,592.)") (emphasis added).

3. The use of catalyst nanoparticles in nanotube synthesis – in particular ferritin – is old and known. (S. 5, [0022]) ("Methods of carbon nanotube production using catalyst nanoparticles 140, 230, such as ferritin, *are known*.") (emphasis added).

4. Alignment of carbon nanotubes grown via chemical vapor deposition is old and known. *See generally* (S. 6, [0023]).

5. Molecular alignment of polymers is old and known. (S. 6, [0025]) ("A number of *known techniques* for molecular alignment of polymer 120, 210 molecules can be of use.") (emphasis added).

6. Modification of sites on proteins, etc. are old and known. (S. 7, [0025]) ("Many techniques for site-specific modification of proteins 210, peptides 210, nucleic acids 120 and other polymers 120, 210 *are known* and can be used in the disclosed methods.") (emphasis added).

7. Preparation and isolation of nucleic acids is old and known. (S. 9, [0030]) ("Methods for preparing and isolating various forms of cellular nucleic acids 120 *are known*.") (emphasis added, citations omitted). *See also* (S. 9, [0033]).

8. Attaching nucleic acids to specific (i.e. non-random) areas on a substrate is old and known. (S. 11, [0040]) ("The nucleic acids 120 can first be attached to specific areas 110, 310 on the substrate using *known techniques*.") (emphasis added). *See also* (S. 12, [0041]) ("Methods for attaching proteins 210, nucleic acids 120 and other polymers 120, 210 to specific areas 110, 310 of a substrate *are well known* and any such known method can be used.") (emphasis added).

9. The nucleic acid, once attached to the substrate, can be aligned by old and known techniques. (S. 12, [0041]). ("The attached nucleic acids 120 can be aligned using any of a number of *known techniques*.") (emphasis added).

10. Polymer (as opposed to nucleic acid) alignment on substrates is old and known. (S. 12, [0042]) ("The method of polymer 120, 210 alignment used is not limiting and any known method.").

11. The use of alternating current to align polymers, including nucleic acids, is old and known. (S. 12, [0042]) ("In the presence of an alternating current electrical field, polymers 120, 210 comprising charged residues, such as the phosphate groups on nucleic acids 120, will align with the field (Adjari and Prost, 1991).").

12. Various methods of purifying and "translating" proteins are old and known. *See e.g.* (S. 18, [0062]) ("Such antibodies can be commercially purchased or can be prepared using *standard techniques known in the art*.") (emphasis added) *and* (S. 18, [0063]) ("Kits for performing in vitro translation *are available from commercial sources*.") (emphasis added).

13. Translation and transcription systems are old and known. (S. 19, [0064]) ("Linked transcription/translation systems *are available from commercial sources*.") (emphasis added).

14. Synthesis of proteins is old and known. (S. 19, [0065]) ("Various automated protein 210 synthesizers *are commercially available* and can be used in accordance with known protocols.") (emphasis added). *See also* (S. 20,[0067]).

15. "Computer modeling" of proteins is old and known. (S. 19, [0068]-[0069]).

16. A host of protein structural information is known, and available on the World Wide Web. (S. 20, [0070]).

17. "Quaternary" assemblies of proteins are old and known. (S. 22, [0072]). ("Methods of designing protein 210 sequences capable of forming quaternary assemblies of proteins 210 *are known in the art*.") (emphasis added).

18. Assembly of proteins on a template is old and known. (S. 22, [0074]) ("These and *other known methods for attaching protein monomers 210 to a substrate in an ordered array* can be used in the methods and apparatus disclosed herein.") (emphasis added). *See also* (S. 22, [0073]) ("In another non-limiting example, *Brown et al. (2002) discussed* the template-directed assembly of a de novo designed protein 210, composed of 63-amino acid residue monomers 210 designed to assemble into an antiparallel β-sheet.") (emphasis added).

19. Modification of proteins is old and known. (S. 23, [0074]) ("Naturally occurring proteins 210 can be chemically modified using *known* side-chain specific reagents.") (S. 23, [0074]) (emphasis added).

20. Alignment of proteins is old and known. *See e.g.* (S. 23, [0075]) ("*Proteins 210 can be aligned using any known molecular alignment method*, such as molecular combing, optical tweezers, microfluidic flow, magnetic fields, free flow electrophoresis, etc., as discussed above.") (emphasis added); *Id.* ("Other known methods, such as forming micropatterned mercaptobenzoic acid and/or mercaptohexadecanoic acid monolayers on gold patches 110, 310 can be used.") (emphasis added, internal citation omitted); (S. 25, [0080]) ("The attached protein 210 can be aligned by *any known molecular alignment technique, such as* optical tweezers, electrophoresis, magnetic fields, molecular combing, microfluidic flow, etc.") (emphasis added)

21. Protein ligation and concentration is old and known. (S. 24, [0076]) ("Methods of protein 210 ligation and concatenation *are generally known* (e.g., Thompson and Ellman, Chem. Rev. 96:555-600, 1996; Cotton and Muir, Chemistry & Biology 6:R247, 1999; Nilsson et al., Organic Lett. 2:1939, 2000) and any such known method can be used.") (emphasis added).

22. Design of protein sequences is old and known. (S. 24, [0078]) ("Where a synthetic protein 210 is used, the protein 210 sequence can be designed to form specific secondary, tertiary and/or quatemary structures, *using known methods*.") (emphasis added).

Reference hereinafter to the preceding admissions will be made in the form "(Admission #)" where # is understood to refer to the numbered list above.

Claim Rejections - 35 USC § 112

The following is a quotation of the first paragraph of 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

Claims 1-6, 8-9, 11, 14-21, and 39-41 rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled

in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention.

The burden on the Examiner as for addressing the adequacy of the written description is set forth in MPEP 2163.04. The findings made by the Examiner should:

> (A) Identify the claim limitation at issue; and
>
> (B) Establish a prima facie case by providing reasons why a person skilled in the art at the time the application was filed would not have recognized that the inventor was in possession of the invention as claimed in view of the disclosure of the application as filed.

MPEP 2163.04. For brevity's sake, the Examiners reasons in support the written description rejections of all claims can be summarized as follows; *all claims and all limitations* sharing these common defects:

Applicants can show possession of the claimed invention in a number of ways. *See generally MPEP 2163* (I. General Principles Governing Compliance With the "Written Description" Requirement for Applications) (*and* case law cited therein). Factors can include: (a) the descriptive means, i.e. words, structures, figures, diagrams, and formulas that fully set forth the claimed invention; (b) description of an actual reduction to practice, including disclosure of drawings or structural chemical formula, or description of testing. *Id.*

Viewed *in toto*, the portions of the Specification where Applicants describe the claimed invention are admittedly old and known, making it unclear whether Applicants possessed any subject matter patentably distinct from the prior art. *Compare e.g.* (S. 13, [0045]-[0046]) ("The method for aligning a molecular wire includes ligating the molecular wire to a double stranded DNA molecule to create a double-stranded DNA/molecular wire hybrid molecule which is applied to a positively charged surface and aligned to the posistively charged surface using fluidic alignment.) (references to drawings omitted) *with e.g.* (Admissions 8, 9, 11, and 21). With

respect to the drawings, it would appear as if they are nothing more than illustrations of what is admittedly old and known. *Compare* (S. 15, [0053]) ("An exemplary embodiment of the invention . . . is disclosed in FIG. 1. A nucleic acid 120 attachment area 110 on the substrate, such as a gold patch 110, is used to attach nucleic acid polymers 120.") *with* (Admission 8). Further, Applicants admit that the claimed technology is readily documented (i.e. "photographed"). *See* (S. 25, [0079]) ("To check the number and pattern of proteins 210 attached to the substrate, dye-stained proteins 210 *could be visualized* by fluorescence microscopy. Alternatively, nanoparticle 230 conjugated proteins 210 *could be visualized by SPM techniques, such as atomic force microscopy (AFM) or scanning tunneling microscopy (STM).*"). Surely, if the invention was reduced to practice, this documentation would have been performed. Such documentation would lend support to Applicants possessing the claimed invention, yet such documentation was not provided. The prior art is replete with examples of arrays of carbon nanotubes on a substrate. *See e.g.* Ren., et al., *Synthesis of Large Arrays of Well-Aligned Carbon Nanotubes on Glass*, Science **282**, 1105 (1998)[1].

Claims 1-6, 8-9, 11, 14-21, and 39-41 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the enablement requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention.

The analysis for determining whether a claim is supported by the disclosure is cast in terms of whether "undue experimentation" is necessary to practice the invention. *See* MPEP 2164.01. In examining the claims in light of the supporting disclosure, the Federal Circuit has

[1] The synthesis technique described by Ren, et al. may in fact be different than claimed in the instant application. The Ren reference is cited in support of showing that Applicants having failed to demonstrate that they possessed

provided a non-exclusive list of factors to consider in determining whether a disclosure is enabling. *See generally In re Wands,* 858 F.2d 731, 737, 8 USPQ2d 1400, 1404 (Fed. Cir. 1988). These factors include:

a. The breadth of the claims;
b. The nature of the invention;
c. The state of the prior art;
d. The level of one of ordinary skill;
e. The level of predictability in the art;
f. The amount of direction provided by the inventor;
g. The existence of working examples; and
h. The quantity of experimentation needed to make or use the invention based on the content of the disclosure

Id. "Whether undue experimentation is needed is not a single, simple factual determination, but rather is a conclusion reached by weighing many factual considerations." *Id.* Examiner has considered all factors in light of all claims rejected makes the following findings of fact:

a. The breadth of the claims

Claim 1 is the broadest claim, drawn to a method requiring only the attachment of a catalyst to a polymer, the polymer to a substrate, the removal of the polymer, and the production of carbon nanotubes attached to the catalyst. Claim 1 does not limit the catalyst, the means for "selecting" a location on the polymer molecules, or the means for generating the carbon nanotube.

b. The nature of the invention

The invention generally relates to the deposition of catalysts on a substrate, from which carbon nanotubes are grown.

c. The state of the prior art and the level of one of ordinary skill

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the claimed invention by failing to show their invention was reduced to practice (i.e. no pictures of nanotubes on a substrate were provided).

Generally speaking, a well developed body of prior art exists related to growth of carbon nanotubes on a substrate – Applicants admit as much. One of ordinary skill in the art would presumably be familiar with the synthesis of carbon nanotubes, as well as deposition of a catalyst on a substrate.

d. The level of predictability in the art

Growth of carbon nanotubes on a substrate has some degree of predictability. *See e.g.* Ren., et al., *Synthesis of Large Arrays of Well-Aligned Carbon Nanotubes on Glass*, Science **282**, 1105 (1998).

e. The amount of direction provided by the inventor

Much, if not most of Applicants' direction is in the form of citation to the work of others. *See* Discussion of Specification, *supra*. As noted in the written description rejection, Applicants "direction" is admittedly old and known.

f. The existence of working examples

No working examples have been demonstrated.

g. The quantity of experimentation needed to make or use the invention based on the content of the disclosure

Viewed as a whole, Applicants have left one seeking to practice the invention with a review of the prior art. No experimental evidence has been provided. Given the permutations and combinations disclosed[2], arguably infinite, and certainly undue experimentation is necessary to practice the invention.

Claim Rejections - 35 USC §§ 102-103

[2] *See e.g.* (S. 14, [0049]) ("A double stranded DNA 120 that is used in the double-stranded DNA/forced flow alignment methods provided herein, is not limited with regard to a specific nucleotide sequence, but *is typically between about 100 and 1,000,000 nucleotides in length*, in cartain aspects between 500 and 50,000 nucleotides in length.") (emphasis added). Applicants have not demonstrated attachment of a catalyst nanoparticle to one nucleotide.

The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

The references teach or suggest each and every limitation of the rejected claims. The pinpoint citations provided are in no way to be construed as limitations of the teachings of the reference, but rather illustrative of particular instances where the teachings may be found.

All art rejections of the Non-Final Office Action dated 06/08/2006 are expressly incorporated herein by reference. The amendments to Claim 1 are editorial, and do not affect the previous rejections.

Claim 41 is rejected under 35 U.S.C. 103(a) as being unpatentable over US 6,401,526 B1 to Dai, et al. in view of US 20040072994 A1 to Herr et al.

The discussion of Dia and Herr in the Non-Final Office Action of 06/08/2006 is expressly incorporated herein by reference. With respect to Claim 41, to the extent Herr may not disclose a "single stranded DNA molecule," a "single strand" molecule is an obvious expedient. It is also noted that a double-helix can be a single strand.

Claims 1-6, 8-9, 11, 14-21, and 39-41 are rejected under 35 U.S.C. 103(a) as being unpatentable over Applicants admissions. The discussion of the admissions found in the specification is expressly incorporated herein by reference.

Conclusion

Applicants' invention was not described in such a way as to convey to one of ordinary skill in the art that the Applicants possessed the claimed invention. Lack of guidance, examples, etc in the Specification have given rise to an enablement rejection. Updating of the search revealed an international search report, the contents of which the Examiner makes of record.

The Examiner reserves the right to reject over all art made of record in response subsequent amendments and arguments. All amendments made in response to this Office Action must be accompanied by a pinpoint citation to the Specification (i.e. page and paragraph or line number).

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Daniel C. McCracken whose telephone number is (571) 272-6537. The examiner can normally be reached on Monday through Friday, 9 AM - 6 PM EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Stanley S. Silverman can be reached on (571) 272-1358. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

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